

# PATENT COOPERATION TREATY

## PCT

### NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 04 October 2000 (04.10.00)	
<b>International application No.</b> PCT/SG00/00013	<b>Applicant's or agent's file reference</b> LAM/99058226
<b>International filing date (day/month/year)</b> 31 January 2000 (31.01.00)	<b>Priority date (day/month/year)</b> 02 February 1999 (02.02.99)
<b>Applicant</b> LOH, Peng, Chum	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
30 August 2000 (30.08.00)

☐ in a notice effecting later election filed with the International Bureau on:  
\_\_\_\_\_

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  <p style="text-align: center;">Pascal Piriou</p> Telephone No.: (41-22) 338.83.38
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<b>Applicant</b> LOH, Peng, Chum	

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30 August 2000 (30.08.00)

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2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland	<b>Authorized officer</b> <p style="text-align: center;">Pascal Piriou</p>
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

## PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

To:

LEE, Ai, Ming  
Rodyk & Davidson  
9 Raffles Place  
#55-01 Republic Plaza  
Singapore 048619  
SINGAPOUR

Date of mailing (day/month/year)

24 September 2001 (24.09.01)

Applicant's or agent's file reference

LAM/99058226

## IMPORTANT NOTIFICATION

International application No.

PCT/SG00/00013

International filing date (day/month/year)

31 January 2000 (31.01.00)

1. The following indications appeared on record concerning:



the applicant



the inventor



the agent



the common representative

Name and Address

SINGAPORE POLYTECHNIC  
500 Dover Road  
Singapore 139651  
Singapore

State of Nationality

SG

State of Residence

SG

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:



the person



the name



the address



the nationality



the residence

Name and Address

SINGAPORE POLYTECHNIC VENTURES PTE  
LTD  
500 Dover Road  
Singapore 139651  
Singapore

State of Nationality

SG

State of Residence

SG

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:



the receiving Office



the International Searching Authority



the International Preliminary Examining Authority



the designated Offices concerned



the elected Offices concerned



other:

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Dominique DELMAS

Telephone No.: (41-22) 338.83.38

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference LAM/99058226	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/SG 00/00013	International filing date (day/month/year) 31 January 2000	(Earliest) Priority Date (day/month/year) 02 February 1999
Applicant 1. SINGAPORE POLYTECHNIC 2. LOH, Peng Chum		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (See Box II).

4. With regard to the title, ☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract, ☒ the text is approved as submitted by the applicant

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ None of the figures

☐ because the applicant failed to suggest a figure

☐ because this figure better characterizes the invention

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>				
Int Cl <sup>7</sup> : C22C 5/02				
According to International Patent Classification (IPC) or to both national classification and IPC				
<b>B. FIELDS SEARCHED</b>				
Minimum documentation searched (classification system followed by classification symbols) C22C 5/02				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	Derwent Abstract Accession No. 87-337282/48 Class M22 (M26) JP 083026 (SEIKO DENSHI K.K.) 12 October 1987	1-15		
X	Derwent Abstract Accession No. 84-173100/28 Class M26 JP 203342 (TANAKA KIKINZOKU KO) 30 May 1982	1-15		
X	Derwent Abstract Accession No. 1999-605102/52 Class M22 (M26) JP 085076 (HANAZAWAT) 17 March 1998	1-15		
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input type="checkbox"/> See patent family annex				
<p>* Special categories of cited documents:</p> <table style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; vertical-align: top;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p> </td> </tr> </table>			<p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>
<p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>			
Date of the actual completion of the international search 03 April 2000		Date of mailing of the international search report 18 APR 2000		
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No.: (02) 6285 3929		Authorized officer  G. CARTER Telephone No.: (02) 6283 2154		

PATENT COOPERATION TREATY  
PCT  
INTERNATIONAL PRELIMINARY EXAMINATION REPORT  
(PCT Article 36 and Rule 70)

09/890548

REC'D 20 FEB 2001

PCT

Applicant's or agent's file reference LAM/99058226	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. PCT/SG00/00013	International Filing Date (day/month/year) 31 January 2000	Priority Date (day/month/year) 2 February 1999
International Patent Classification (IPC) or national classification and IPC Int. Cl. <sup>7</sup> C22C5/02		
Applicant SINGAPORE POLYTECHNIC et al		

1.	This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.																									
2.	This REPORT consists of a total of 3 sheets, including this cover sheet. <input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of      sheet(s).																									
3.	This report contains indications relating to the following items: <table border="0"><tr><td>I</td><td><input checked="" type="checkbox"/></td><td>Basis of the report</td></tr><tr><td>II</td><td><input type="checkbox"/></td><td>Priority</td></tr><tr><td>III</td><td><input type="checkbox"/></td><td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td></tr><tr><td>IV</td><td><input type="checkbox"/></td><td>Lack of unity of invention</td></tr><tr><td>V</td><td><input checked="" type="checkbox"/></td><td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td></tr><tr><td>VI</td><td><input type="checkbox"/></td><td>Certain documents cited</td></tr><tr><td>VII</td><td><input type="checkbox"/></td><td>Certain defects in the international application</td></tr><tr><td>VIII</td><td><input type="checkbox"/></td><td>Certain observations on the international application</td></tr></table>		I	<input checked="" type="checkbox"/>	Basis of the report	II	<input type="checkbox"/>	Priority	III	<input type="checkbox"/>	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	IV	<input type="checkbox"/>	Lack of unity of invention	V	<input checked="" type="checkbox"/>	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	VI	<input type="checkbox"/>	Certain documents cited	VII	<input type="checkbox"/>	Certain defects in the international application	VIII	<input type="checkbox"/>	Certain observations on the international application
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VII	<input type="checkbox"/>	Certain defects in the international application																								
VIII	<input type="checkbox"/>	Certain observations on the international application																								

Date of submission of the demand 30 August 2000	Date of completion of the report 31 January 2001
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer  G. Carter Telephone No. (02) 6283

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☒ the international application as originally filed.
- ☐ the description,        pages , as originally filed,  
   pages , filed with the demand,  
   pages , received on    with the letter of
- ☐ the claims,                pages , as originally filed,  
   pages , as amended (together with any statement) under Article 19,  
   pages , filed with the demand,  
   pages , received on    with the letter of
- ☐ the drawings,            pages , as originally filed,  
   pages , filed with the demand,  
   pages , received on    with the letter of
- ☐ the sequence listing part of the description:  
   pages , as originally filed  
   pages , filed with the demand  
   pages , received on    with the letter of

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, was on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description,        pages
- ☐ the claims,            Nos.
- ☐ the drawings,        sheets/fig.

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims 1-15	YES
	Claims	NO
Inventive step (IS)	Claims 1-15	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-15	YES
	Claims	NO

**2. Citations and explanations (Rule 70.7)**

None of the citations disclose the specific range claimed for which the alloy has an advantage in its hardness.





## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>C22C 5/02</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/46413</b> <b>(43) International Publication Date:</b> 10 August 2000 (10.08.00)
<b>(21) International Application Number:</b> PCT/SG00/00013 <b>(22) International Filing Date:</b> 31 January 2000 (31.01.00) <b>(30) Priority Data:</b> 9900056-4 2 February 1999 (02.02.99) SG <b>(71) Applicant (for all designated States except US):</b> SINGAPORE POLYTECHNIC [SG/SG]; 500 Dover Road, Singapore 139651 (SG). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> LOH, Peng, Chum [SG/SG]; 500 Dover Road, Singapore 139651 (SG). <b>(74) Agent:</b> LEE, Ai, Ming; Rodyk & Davidson, 9 Raffles Place, #55-01 Republic Plaza, Singapore 048619 (SG).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> JEWELLERY ALLOY COMPOSITIONS		
<b>(57) Abstract</b>  A jewellery alloy, having a substantially purple hue and sufficient toughness to withstand Rockwell B hardness testing with a 100 kg load without shattering, comprises 76 to 83.5 wt.% gold and 16.5 to 21.5 wt.% aluminium. In one embodiment, the alloy consists of more than 78.5 wt.% gold (but not more than 83.5 wt.%) and a balance of aluminium. In another embodiment, the alloy comprises an additional element selected from palladium and nickel.		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
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EE	Estonia			SG	Singapore		

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## JEWELLERY ALLOY COMPOSITIONS

10       The present invention relates to novel jewellery alloy compositions.

Aluminium - gold alloys, with their comparable atomic size factors (2.878:2.8577), similar lattice crystal structure (f.c.c.) and large variation in electro-  
15 negativity factor, produce a diversity of microstructures and phases. The aluminium-gold phase diagram illustrates regions of solid solution, eutectic, and complex compounds ( $\text{Au}_5\text{Al}_3$ ,  $\text{Au}_3\text{Al}$ , gamma, etc). The  $\text{Au}_3\text{Al}$  intermetallic compound is a complex cubic structure similar to  $\beta$   
20 manganese and is a somewhat metastable state, with an electron: atom ratio of 3:2 and a weight percent ratio of 78.5%Au:21.5%Al. It is of particular interest to jewellers and the like because of its brilliant purple-golden colour.

However, interest is largely offset by the fact that the  
25  $\text{Au}_3\text{Al}$  intermetallic compound is very brittle; like ordinary glass or porcelain it will fracture with a hard knock. In fact, its brittleness is such that the  $\text{Au}_3\text{Al}$  intermetallic compound cannot be hardness tested using the Rockwell B

hardness testing machine with a 100 kg load; it will fracture even when a 60 kg load is applied.

According to the teachings of Japanese patent application JP 61-30642 in the name Tokuriki Honten Pte 5 Ltd, one way of overcoming the brittleness problem is to lower the gold component to 75 wt% whilst employing aluminium in an amount 20 to 24.5 wt%, and at the same time introducing 0.5 to 5 wt% of one or two additional elements selected from the group consisting of silicon, magnesium, 10 copper, zinc or manganese. By varying the relative amount of the additional element(s), the tone or hue of the colour may be changed subtly without losing the basic purple colour.

As can be seen from the Au-Al phase diagram, lowering 15 the gold content below 78.5 wt% in the AuAl system gives rise to the co-existence of two structures - the Au<sub>3</sub>Al intermetallic compound and the eutectic structure of Al and AuAl<sub>3</sub> - in the same sample. Thus, upon slow cooling from the molten phase or annealing of rapidly solidified samples, 20 precipitation of the aluminium rich eutectic phase on outward surfaces degrades the purple-golden colour. Even if rapidly solidified samples are not annealed, similar decolouration of the purple-gold colour may also occur after fabricating and polishing the jewellery and possibly 25 even through prolonged usage, albeit at a much slower rate. The hardness of the eutectic and Au<sub>3</sub>Al phase is also significantly lower (around 10% for an alloy of 75 wt% gold and 25 wt% aluminium) than that of the Au<sub>3</sub>Al intermetallic

compound. For these two reasons, the commercial viability of the alloy is limited.

It is an object of the present invention to provide a novel jewellery alloy which for the purposes of the present specification is defined as having sufficient toughness to withstand Rockwell B hardness testing with a 100 kg load without shattering. Being able to use Rockwell B hardness testing is perceived as an empirical measure that the alloy is suitable for fabricating jewellery; if the alloy is too brittle to withstand Rockwell B hardness testing, it is too brittle to be used in jewellery. The term "jewellery" is intended to cover ornamental objects for personal adornment or otherwise, including medallions, and the like (eg coins) where the stated toughness is a prerequisite.

15 In accordance with a first aspect of the present invention there is provided a jewellery alloy as hereinbefore defined, comprising 76-83.5 wt% gold and 16.5-21.5 wt% aluminium, and having a substantially purple hue (at least on annealing at 600°C).

20 By definition, the jewellery alloy does not include pure intermetallic compound  $\text{Au}_3\text{Al}$  (78.5 wt% Au and 21.5 wt% Al) because it does not have the toughness to withstand Rockwell B hardness testing with a 100 kg load. The term 'substantially purple hue' includes the colours reddish or  
25 pinkish purple and lighter purples.

Preferably, the hardness of the jewellery alloy remains substantially similar to that of the  $\text{Au}_3\text{Al}$  intermetallic compound; that is to say, the hardness of the

jewellery alloy is within about 6%, more preferably 5%, of the hardness of Au<sub>3</sub>Al.

In one embodiment, the gold content may be above 78.5 wt% up to a maximum of 83.5 wt%, with the balance being 5 aluminium. In this way, the requisite toughness is achieved by producing a gamma-phase gold aluminium structure.

In another embodiment, the jewellery alloy may have a gold content of less than 78.5 wt% and further comprise an 10 additional element selected from the group consisting of palladium and nickel. The aluminium content may preferably be 18.5-19.5wt%. The gold/aluminium ratio is preferably higher than 3.66. In preferred alloys, the amount of palladium when used as the additional element is in the 15 range 0.5wt% to 4.0wt%; the amount of nickel when used as the additional element is in the range 1.0wt% to 2.0wt%.

There is also provided an article comprising a metal component, wherein the metal component is fabricated from a 20 jewellery alloy in accordance with the present invention.

In accordance with a second aspect of the present invention, there is provided a jewellery alloy containing 16.5-21.5 wt% aluminium, 0-4.0 wt% palladium, 0-2 wt% 25 nickel and balance gold (except for impurities and incidental elements). The jewellery alloy may optionally contain small or trace amounts of elements, (eg oxygen) either constituting incidental constituents added in

accordance with established practice or present as impurities. In one embodiment, the jewellery alloy may be a binary alloy containing at least 16.5 wt% up to (but not including) 21.5% aluminium, and balance gold. In a second embodiment, the jewellery alloy may contain 0.5-4.0 wt% palladium, with nickel substantially absent. In a third embodiment, the jewellery alloy may contain 1.0-2.0 wt% nickel, with palladium substantially absent. In all embodiments, the gold/aluminium ratio should be higher than 3.66. In the second and third embodiments, the aluminium content is preferably 18.5-19.5 wt%.

According to a third aspect of the present invention, there is provided an alloy containing 18.5-19.5 wt% aluminium, 0.5-4.0 wt% palladium and balance gold. According to a fourth aspect of the present invention, there is provided an alloy containing 18.5-19.5 wt% aluminium, 1.0-2.0 wt% nickel and balance gold.

A better understanding of the present invention may be obtained in the light of the following examples embodying the invention which are set forth to illustrate, but are not to be construed as limiting, the present invention.

Six example alloys embodying the present invention and two control alloys were manufactured and tested as follows:

1. All specimens were tested using a Rockwell B hardness testing machine with a 100 kg load. Where it was apparent that a specimen lacked sufficient toughness to withstand the Rockwell B hardness test, micro hardness testing with a 200g load was first

conducted followed by an annealing and subsequent Rockwell B hardness testing.

ii) All specimens were annealed at 600°C and examined for precipitation of low melting point aluminium-rich eutectic. Such precipitation would be evident from the appearance of a greyish-white colour between reddish-purple regions on the specimen surface.

Control 1 (78.5 wt% Au and 21.5 wt% Al).

The Au<sub>3</sub>Al intermetallic compound has a brilliant purple hue, but is known to be brittle. The micro-hardness testing with a 200g load gave a reading of Vickers 250 (HRB-102 by conversion). After annealing no visible precipitates were found. Subsequent testing with Rockwell B hardness machine resulted in multiple fracturing of the specimen.

Control 2 (75 wt% Au and 25 wt%Al).

The specimen has a reddish-purple colour, but was much softer than control 1 having a HRB of 91. Subsequent annealing resulted in large amounts of Al-rich eutectic precipitation which seriously degrades the surface reddish-purple colour.

Example 1 (80.5 wt% Au and 19.5 wt% Al).

In comparison with control 1, the specimen was slightly softer (HRB of 101), but much tougher as demonstrated by the fact that the sample survived Rockwell B hardness testing. Subsequent annealing showed no sign of precipitation and grain structure colour was pinkish-purple.



Example 2 (81 wt% Au and 19wt% Al).

In comparison with control 1, the specimen was softer (HRB of 96), but much tougher as demonstrated by withstanding a Rockwell B hardness test. Subsequent annealing showed no sign of precipitates and the grain structure colour was pinkish-purple.

Example 3 (79.7 wt% Au, 19.3 wt% Al and 1 wt% Pd).

In comparison with control 1, the specimen was slightly harder (HRB of 103), but much tougher as demonstrated by withstanding a Rockwell B hardness test. Subsequent annealing showed no sign of precipitation and the grain structure was pinkish-purple.

Example 4 (79.7 wt% Au, 19.3 wt% Al and 1.0 wt% Ni)

In comparison to control 1, the specimen was softer (HRB of 97.5), but much tougher as demonstrated by withstanding a Rockwell B hardness test. Subsequent annealing showed no sign of precipitates, and the grain structure colour was pinkish purple.

Example 5 (79.4 wt%, 18.6 wt% Al and 2.0 wt% Pd)

In comparison with control 1, the specimen was softer (HRB of 97), but much tougher as demonstrated by withstanding a Rockwell B hardness test. Subsequent annealing showed no sign of precipitation, and the grain structure colour was pinkish purple.

Example 6 (77 wt% Au, 20 wt% Al and 3 wt% Pd).

In comparison with control 1, the specimen was slightly harder (HRB of 104.8), but much tougher as

demonstrated by withstanding the Rockwell B hardness test.

Subsequent annealing showed no signs of precipitates and the grain structure colour was pinkish purple.

The foregoing examples demonstrate that it is possible  
5 to make a tough purple gold-rich alloy by transforming the fragile and brittle  $\text{Au}_3\text{Al}$  intermetallic compound into the tougher gamma phase structure by either increasing the gold content above 78.5 wt% (75% molar content) or by alloying with additional element(s).

CLAIMS

1. A jewellery alloy as hereinbefore defined, comprising 76-83.5 wt% gold and 16.5-21.5 wt% aluminium, and having a substantially purple hue.
- 5 2. A jewellery alloy according to claim 1, having a hardness substantially similar to that of the intermetallic compound  $\text{Au}_3\text{Al}$  (78.5 wt% Au and 21.5 wt% Al).
3. A jewellery alloy according to claim 2, in which the hardness is within 6% of the hardness of the intermetallic  
10 compound  $\text{Au}_3\text{Al}$ .
4. A jewellery alloy according to any one of the preceding claims, consisting of more than 78.5wt% and up to and including 83.5 wt% gold and a balance of aluminium.
5. A jewellery alloy according to any one of claims 1 to  
15 3, further comprising an additional element selected from the group consisting of palladium and nickel.
6. A jewellery alloy according to claim 5, in which the aluminium content is 18.5-19.5 wt%.
7. A jewellery alloy according to claim 6, wherein the  
20 gold to aluminium ratio is at least 3.66.
8. A jewellery alloy according to claim 5, claim 6 or claim 7, wherein the additional element is palladium and is present in an amount of between 0.5 wt% and 4.0 wt%.
9. A jewellery alloy according to claim 5, claim 6 or  
25 claim 7, wherein the additional element is nickel and is present in an amount of between 1.0 wt% and 2.0 wt%.
10. An article comprising a metal component, wherein the metal component comprises a jewellery alloy according to

any one of the preceding claims.

11. An article according to claim 10, wherein the article is selected from the group consisting of ornamental jewellery, medallions and coins.

5 12. A jewellery alloy substantially as hereinbefore described with reference to the accompanying examples.

13. A jewellery alloy containing 16.5-21.5 wt% aluminium, 0-4.0 wt% palladium, 0-2 wt% nickel and balance gold (except for impurities and incidental elements).

10 14. An alloy containing 18.5-19.5 wt% aluminium, 0.5-4.0 wt% palladium and balance gold.

15. An alloy containing 18.5-19.5 wt% aluminium, 1.0-2.0 wt% nickel and balance gold

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SG 00/00013**A. CLASSIFICATION OF SUBJECT MATTER**Int Cl<sup>7</sup>: C22C 5/02

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**Minimum documentation searched (classification system followed by classification symbols)  
C22C 5/02Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
AU: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent Abstract Accession No. 87-337282/48 Class M22 (M26) JP 083026 (SEIKO DENSHI K.K.) 12 October 1987	1-15
X	Derwent Abstract Accession No. 84-173100/28 Class M26 JP 203342 (TANAKA KIKINZOKU KO) 30 May 1982	1-15
X	Derwent Abstract Accession No. 1999-605102/52 Class M22 (M26) JP 085076 (HANAZAWAT) 17 March 1998	1-15

☐ Further documents are listed in the  
continuation of Box C☐ See patent family annex

\* Special categories of cited documents:

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 "&" document member of the same patent family

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